Automatic Type Deduction Exercises

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auto

- What is meant by "auto" in Modern C++?
- Why is auto important?
- Write a program which defines variables using "auto". Print out the values of the variables

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auto with qualifiers

- What happens when the initializer is a const int?
- What happens when the initializer is a reference to int?
- Write a function which returns a reference to const int
- Write a program which creates a variable using auto and initializes it with the return value from this function
- Demonstrate that the created variable is not const
- Modify the program so that the variable is a const reference
- Demonstrate that now the created variable is const

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Using auto to simplify your code

- Use auto to write down simpler versions of the following definitions

```
pair<set<int>::iterator, bool> ret = ints.insert(3);
for (map<string, int>::iterator it = scores.begin(); it != scores.end(); ++it) ...
```

- Suppose we want to prevent the loop from changing the map elements in the second example. Is this possible?

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decltype

- Explain the purpose of decltype
- Imagine we have a function func() that returns a value
- We want to create a variable x which has the same type as this return value
- Write down a definition of x which uses decltype to deduce x's type

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decltype

- Write a function which returns a reference to const int
- Write a program which creates a variable using decltype and the return type of this function
- What is the type of this variable?
- Demonstrate whether the variable is const

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decltype and references

- What happens if the argument to decltype is const?
- What happens if the argument to decltype is a reference?
- In the following code, what is the deduced type of j?

```
int i;
decltype(i) j;
```

- Write down a definition which produces the expected result

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decltype(auto)

- Explain the purpose of decltype(auto)
- Write a function which returns a reference to const int
- Write a program which creates a variable using decltype(auto) and initializes it with the return value from this function
- Demonstrate that the created variable is const

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Functions returning auto

- What does it mean for a function to return auto?
- Is this a desirable thing to do?

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